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ABSTRACT

Because research studies on post-relocation mortality in the elderly have come to inconsistent and contradictory conclusions, clinical teams recommending patients for placement are still relying on educated intuition as a basis for clinical decisions in what may be a life-or-death matter for elderly institutionalized patients. This study was conducted to determine if patients at one state psychiatric hospital who were recommended for nursing home placement and were relocated to nursing homes were more likely to die than non-relocated patients. The study also sought to determine the factors which characterized the patients who died soon after the move. When mortality data were compared between a group of geriatric patients (N=99) relocated to nursing homes from a state psychiatric hospital and an inpatient control group (N=99) matched on age, sex, psychiatric diagnosis, and length of hospitalization, the number dying in the relocated group was significantly larger during the first 8 months post-placement (p .05). Early deaths were found to be associated with age at placement, cardiovascular disease, healed fractures (p .05) and dementia (p .15). A discriminant model using these four variables categorized those dying early from those dying after 8.4 months (p .01). (Author/NB)

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Predictors of Increased Death Following Relocation in Institutionalized Elderly

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Running head: PREDICTORS OF DEATH FOLLOWING RELOCATION

Abstract

When mortality data were compared between a group of geriatric patients relocated to nursing homes from a state psychiatric hospital and an inpatient control group matched on age, sex, psychiatric diagnosis and length of hospitalization, the number dying in the relocated group was significantly larger during the first 8 months post-placement ($p<.05$). To improve placement recommendations, we looked for factors that would differentiate between the relocated patients dying during the first 8 months and those dying later. Early deaths were related to age at placement, cardiovascular disease, healed fractures ($p<.05$) and dementia ($p<.15$) A discriminant model using these 4 variables, categorized those dying early from those dying after 8.4 months ($p<.01$). Application of the discriminant coeffecients to improve clinical recommendations for individual cases is illustrated.

Predictors of Increased Death Following Relocation in Institutionalized Elderly

Research studies on post-relocation mortality in the elderly have frequently come to inconsistent and contradictory conclusions. Some researchers have found significant increases in mortality rates following relocation (Aldrich and Mendkoff, 1963; Bourestom and Tars, 1974; Czank and Zweig, 1980; Kral, Grad and Berenson, 1968; Markus, Blenkner, Bloom and Downs, 1970), while others have found either insufficient evidence to implicate relocation in higher death rates or have found no negative effects secondary to such moves (Borup, Gallego and Heffernan, 1979, Brody, Kleban and Moss, 1974; Kelly, 1983; Kowalski, 1978). While exhaustive reviews exist (Coffman, 1981; Schulz and Brenner, 1977) to inform the reader of the variety of studies available to confirm or deny one's hypotheses, clinical teams recommending patients for placement are still relying on educated intuition as a basis for clinical decisions in what may be a life-or-death matter for elderly institutionalized patients.

Finding ourselves in this position at Kerrville

State Hospital, this study was undertaken to determine if our patients who were recommended for nursing home placement and were relocated to nursing homes were more likely to die. Further, among the relocated patients we sought to determine the factors which characterized the patients dying soon after the move so that these factors could be used as predictors allowing us to make better decisions.

High risk variables for poor adjustment that have been identified include age, physical condition and psychiatric diagnosis. Beaver (1979) found that good physical health was the most important predictor of positive post-relocation adjustment. Markus, et al (1970) found differences according to age, sex and residency experiences. Goplerud (1979) reported that physically frail, nonambulatory and severely cognitively impaired individuals were more susceptible to relocation stress. Kowalski (1978) found incontinence, morbidity, dependence, and the level of care required were important variables. Several studies have shown brain damaged patients are less adaptable to change and are therefore at risk following relocation (Czank and Zweig, 1980; Markus, et al, 1970; Schulz, 1976).

Nirenberg (1983) found that patients who scored low on a test of intellectual functioning demonstrated a general withdrawal from active behaviors after relocation, while those who scored high on the same test showed a decrease in passivity and withdrawal. Brody, Kleban and Moss (1974) found that relocated patients took eight months after relocation to return to baseline levels on personality adjustment scales. Time has also been shown to be a significant factor in mortality. Mortality has reportedly been highest in the three months immediately following relocation (Aldrich and Mendkoff, 1963; Bourestom and Tars, 1974). Kowalski (1978) found that most deaths following a fire-related nursing home relocation occurred 62 to 89 days later.

Participation by the patient in the decision making process has been shown to be of importance in reducing negative relocation effects. Pino, Rosica and Carter (1978) prepared a group of patients prior to transfer by scheduling five counseling sessions, conducted by social workers, which concentrated on the patient's feelings and concerns. The patient also visited the new site and

participated in the selection of room assignments. Staff members were exposed to relocation research findings to heighten their awareness. Regular group activities with the residents focused on the upcoming move. These patients' post-relocation adjustment was compared with another relocated group who received no specialized sessions to prepare them. The second group consisted of patients who were involuntarily relocated. The unprepared group did not show a significantly higher mortality rate than the prepared group, but did perform lower on tests of mental alertness and activities of daily living. The researchers concluded that successful adjustment is affected by the patient's degree of preparation, the patient's attitude toward the move and their level of mental and physical functioning before the relocation.

Reuben and Byrnes (1977) suggested that a visit to the prospective location by the patient and family be arranged, if possible. A visit by the nursing home representative was also suggested, as was the presentation of pictures, slides of floor plans of the home. Beaver (1979) found that a majority of successful

adjustors felt it was important to consider the activities available at the new location prior to the transfer. Czank and Zweig (1980) suggested that the most crucial time period for organically impaired relocatees is after the move, when the experience of loss of family and familiar surroundings becomes reality.

Kerrville State Hospital (KSH) is a component of the Texas Department of Mental Health and Mental Retardation and is a geropsychiatric facility. Since 1978 we have been studying the nature of relocation stress on patients who have been involuntarily placed in nursing care facilities within a local catchment area. We have placed particular emphasis on investigating mortality among these patients in an attempt to validate what effects, if any, the relocations have had on life expectancy. We have also looked at the relocated patients to determine if there are characteristics which identify those patients who die early from those living or dying later following the move.

METHOD

Subjects

Ninety-nine patients were placed in area nursing homes from July 1, 1978 to July 1, 1982 (36 males and 63 females). A control group of equal size was drawn on the basis of age similarity from all KSH patients who were recommended for alternate care placement during the same time period, but who were denied such placement for primarily financial reasons. The average length of time since symptoms requiring hospitalization occurred was 17 years and the average subject age was 77 years old.

About two-thirds of the patients were psychiatrically diagnosed as organic with Alzheimer's disease being the primary reason. See Table 1 for a summary.

Insert Table 1 about here

By January 1, 1984 a total of 48 of the relocated individuals had died (18 males and 30 females). The characteristics of these individuals are discussed in the results section.

Procedure.

Patients are considered by Treatment Teams on each ward for suitability for nursing home placement. If a patient is deemed an appropriate candidate by the Team, a referral is made to the Liaison Office, which in turn investigates the possibility of placement. If a patient qualifies for placement, then the Treatment Team typically furloughs the patient for a 30 day trial period. If a satisfactory adjustment occurs, the patient is then discharged from the hospital. The Liaison Caseworker then monitors the patient's welfare through personal visits and telephone calls.

Phase I.

Hospital medical records were scrutinized to obtain information on all subjects. The patient's name, age, sex, psychiatric diagnosis, length of continuous hospitalization (chronicity), latency from recommendation to transfer, and date of death (if applicable) were initially collected. To equalize the time related variables (latency to death and age at relocation), we chose to utilize the date of recommendation for computations in both recommended and

placed groups. The observation period varied from a minimum of 18 months (July, 1978 through January, 1982) to maximum observation period of 66 months (for those patients placed or recommended July, 1978).

To make sure that our groups were satisfactorily matched we chose to check for confounding differences among subject variable. Diagnosis and sex were compared using chi-square analyses to check for confounding differences between the two groups. Age and chronicity were tested for differences using *t*-tests. A chi-square was used to analyze differences in the total number of deaths occurring in each group and a t-test was used to test for differences in the ages at death. The distribution of latencies to death following recommendation was positively skewed in both recommended and placed groups, so a Mann-Whitney U was applied to determine if there were significant differences between groups.

For a graphic comparison, an institutional baseline, the percent dying per month, was calculated from the hospital monthly reports which showed the average monthly census and the number of patients dying each month.

Phase II.

This phase began two years later when we chose to look at the group of transferred patients in more detail. In addition to the information already obtained on age, sex, length of continuous hospitalization, and psychiatric diagnoses, we reviewed all records to obtain all existing physical disorders that had been recorded by a physician at the time of transfer. This was usually found on a Diagnostic and Statistical Manual III data sheet, a physical examination or a treatment plan document. All the demographic information was collected and tabled.

After completing the data gathering of the physical diagnoses, a frequency count was performed to ascertain the most frequently occurring physical variables. A total of 187 diagnoses were recorded with frequencies of 1 to 61. The seven highest frequency diagnoses were selected for analysis.

Using a Digital Equipment Corporation VAX-11/780 computer with SPSS-X (Release 2.1) statistical software, we conducted an exploratory data analysis using univariate analysis of variance, correlation analysis,

and discriminant analysis to determine which variables were most accurate in predicting who would die following relocation. The following variables were used:

Sex

Age at placement

Length of time in the institution

The presence or absence of the following physical and psychiatric characteristics were also used:

Dementia

Cancer

Schizophrenia

Cardiovascular Disease

Cataracts

Healed Fractures

Osteoporosis

Scoliosis

Edentulousness

Those variables that proved significant with the ANOVA and did not have high intercorrelations were used to develop a discriminant analysis model. The subjects were divided into two groups for the ANOVA and discriminant analysis model; those who died within the

first 8.4 months and those who lived beyond the 8.4 months. The 8.4 month time division was selected for the model after studying the monthly percentage of patients dying for a four year period following placement. In scrutinizing the data, it was observed that peak death rates occurred at about 3 months, 8.4 months and 11 months (see Figure 2). Models were developed using the 3 month and 11 month time divisions, but these were not statistically significant. The study by Brody, Klepan, and Moss (1974) supports the eight month division: their study indicated that patients took eight months to return to baseline levels on personality adjustment scales after relocation.

Results

Phase I.

The results of the tests to check for confounding differences between subject variables found no significant differences. Sex and diagnosis were nonsignificant, as were age and chronicity. When the dependent variables were examined, no significant differences in age at death or latency to death from recommendation were found. However, the number of

deaths occurring in the experimental (placed) group was found to be significantly larger than the number occurring in control (recommended) group, $x^2(1) = 4.08$, $p < .05$ (see Figure 1).

Insert Figure 1 about here

Phase II.

Ninety-nine cases were utilized to develop the univariate analysis of variance, correlation coefficients and discriminant analysis model with 32 subjects dying within the first 8.4 months and 67 who survived beyond 8.4 months. The results of the univariate ANOVA with F-statistics are given in Table 2.

Insert Table 2 about here

Age at placement, cardiovascular disease, and healed fractures were statistically significant in the ANOVA (at the 95% confidence level) in differentiating between those patients who died soon after relocation (within 8.4 months) and those who died later. Dementia

was only significant at the 85% level, but was included in the model as the most significant psychiatric characteristic. These four variables were then used to develop a discriminant analysis model to predict relocation mortality. Pearson correlation coefficients (see Table 3) were developed for this reduced variable set to determine if any intercorrelations might exist between these variables that could bias the model coefficients. No statistically significant intercorrelations were determined.

Insert Table 3 about here

The discriminant analysis model produced a chi-square statistic of 12.888 with 4 degrees of freedom. This indicates a statistically significant model at the 99% level (2 = 0.297 at the 99% level) and therefore, the null hypothesis of equal group means was rejected and the groups were assumed to represent distinct populations. The discriminant coefficients for the model are given in Table 4. Comparison of the coefficients to determine the variables that most

significantly contribute to group differences is difficult due to scaling problems between variables; age is a continuous variable with the other variables being dichotomous. The second column in Table 4 scales the coefficients for comparison. Age at placement, cardiovascular disease, and healed fractures contribute equally to the model with dementia contributing slightly less to the model. These results parallel the univariate analysis of variance results in Table 2.

Insert Table 4 & 5 about here

The discriminant analysis model coefficients were then applied to the 99 cases to further test the predictive capability of the model. Table 5 indicates that 58.6% of the patients were correctly classified.

Application of our results to aid in clinical decisions regarding the individual recommendations for relocation are detailed in the Appendix.

Discussion

It should be noted that these patients were

typically relocated involuntarily, a variable that has been cited by others (Pino, et al, 1978) as mitigating against satisfactory post-relocation adjustment. Our subjects showed a high degree of organic brain disorder (69% in the experimental group and 70% in the control group), which has also been identified as a high risk variable (Czank and Zweig, 1980; Markus, et al, 1970; Schulz, 1976) and may tend to account for the high mortality figures. Another variable cited in the literature is the degree of environmental change experienced by the relocatee (Bourestom and Tars, 1974). Our subjects were, for the most part, chronically institutionalized (see Table 1) and were therefore subjected to a low degree of relative change, i.e., from institution to institution.

Patients in both the experimental (placed) and control (recommended) groups tended to be in poorer physical health than the general hospital population. It can be seen in Figure 2 that both had higher than expected rates of death during the first month in comparison to the institutional rate. This higher than

expected number of early deaths in the recommended group may have prevented the detection of significant differences in death latencies between the experimental and control groups. The shortened life expectancy of both groups may mask effects of relocation on mortality.

Insert Figure 2 about here

After the first month the rates of death for those recommended returned to the institutional baseline (see Figure 2). Half of the patients dying in the experimental group were deceased by the end of the third month whereas half of the patients dying in the control group were not dead until the seventh month. This replicated Aldrich and Mendkoff (1963) and Bourestom and Tars (1974) in finding that mortality was highest in the first three months following relocation (see Figure 3). The distribution of deaths seen following placement suggests that not all patients are adversely affected, as rates return to normal in the placed group before the end of a year (see Figures 2 and 3).

Insert Figure 3 about here

In selecting healed fractures, cardiovascular disease, age at placement and dementia as variables in a model for predicting mortality risk among this subject population, it appears that some conclusions can be drawn which have clinical implications.

Healed fractures were negatively related to classifications in the mortality group, thus it would appear that this represents a "survival" factor, i.e., having a fracture that had healed tends to identify patients who will not belong to the mortality group. Nickens (1983) reported in a review of 26 clinical studies, that a 25% mortality rate among post-hip fractures was typical. Further, Baker, et al (1978) found that hip fracture patients with dementia have higher than expected mortality rates. Our finding that healed fractures are negatively correlated with mortality suggests that this injury acts as a selection factor with those individuals who survived an earlier brush with death via a fracture (hip or otherwise) being

more resilient and less prone to a quick death, following relocation.

Our finding that dementia is predictive corresponds to previously published findings that relate the disorder to relocation mortality rates. Goplerud (1979) reported cognitively impaired individuals were more susceptible to relocation stress. Other studies (Czank and Zweig, 1980), (Markus, et al, 1970) have also shown higher than expected risks for brain damaged patients. Possibly patients with dementia are less adaptable to changes in their environment having fewer cognitive resources. The social impairments associated with dementia (i.e., these patients are frequently unable to form significant social relationships due to communication and affective disturbances) also may impact the patient's ability to formulate social contacts in the new environment and this may affect their ability to adjust satisfactorily to the new environment.

A curvilinear relationship may exist between the severity of the dementia and mortality rates, such that individuals with mild impairments and those with

severe impairments may have lower rates than expected for moderately impaired individuals. This idea would be related to the level of awareness. The mildly impaired individuals, although aware of the change, have more cognitive resources to deal with the change than do moderately impaired individuals who do not have the cognitive ability to cope successfully. The severely impaired individual, although not having the resources to deal with the change, also has the least awareness of the change.

Age at placement is a variable which can be verified with actuarial tables of life expectancy. Older persons tend to have higher mortality rates, so this finding is a consensually valid idea and seems logical for the model.

Cardiovascular disease and it's relationship to mortality expectation is a controversial and highly published observation. During 1981, 989,606 deaths in the United States were officially attributed to cardiovascular disease. This comprised 49.8% of all deaths recorded in the United Stated during that year (Wyngaarden and Smith, 1985). Our study considered 187

physical diseases when deriving the statistical model, and cardiovascular disease was selected with a high degree of correlation with relocation mortality. These findings seem to firmly suggest that the cardiovascular system is one that clinicians should carefully evaluate prior to recommending patients for relocation from institutions into alternate care settings.

Our data may be criticized as coming from existing records with diagnoses being made by a number of different physicians acting independently. In addition to individual biases, there may be general tendencies to either over or under report certain problems among the elderly. (For example, heart failure is often listed but severe constipation infrequently listed on death certificate though a number of elderly die of impactions.) Future studies could improve reliability by using a diagnostic team of physicians and by reducing reporting biases. The fact will remain that individual physicians will be primary diagnosticians for most elderly recommended for nursing home placement. Although all factors having an impact on survival may never be known, prospective studies and quantitative

assessment of additional variables should improve the predictive validity of our model. Meanwhile we no longer need to talk about relocation in general terms as increasing or decreasing mortality but can make clinical decisions quantitatively at an above chance level to reduce inappropriate placements for at risk elderly individuals.

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APPENDIX

The discriminant coefficients described in Table 4 can be used to predict whether a patient will die within the first 8.4 months after relocation.

The application of the mathematical model involves calculating the coefficients of each variable multiplied by the actual variable value for the patient under consideration. The equation is as follows:

$$Y = (-1.2232 \times HDFR) + (1.1352 \times CARDIO) + (0.0589 \times AGE) + (0.7444 \times DEMENT) + (-5.0812)$$

where,

HDFR is the presence (value 1) or absence (value 0) of a healed fracture.

CARDIO is the presence (value 1) or absence (value 0) of cardiovascular disease.

AGE is the age of the patient in years.

DEMENT is the presence (value 1) or absence (value 0) of dementia

The computed value of Y should be compared with the function means of each group. The function mean of those who lived is -0.208 and the function mean of those who did not survive is 0.5460. If the computed value falls mid-way between these function values, then it would be difficult to predict the patient's survival.

An example of a patient who might not survive is a person 81.5 years old who is demented, but does not have a healed fracture nor cardiovascular disease. The computed value of Y would be 0.4636 which is near the function mean of those who did not survive. Therefore, this patient would not be a candidate for relocation.

Another example of a patient more likely to survive is a person 71.2 years old who has a healed fracture, but is not demented nor has cardiovascular disease. The computed value of Y would be -2.11 which is near the function mean of those who did survive. This patient would be a candidate for relocation.

This predicting equation can never predict with complete certainty whether a patient will survive after relocation. Generally, "older" (80 years or older) patients with cardiovascular disease and dementia are more likely not to survive; whereas, "younger" (less than 77 years) patients with healed fractures are more likely to survive.

The greatest accuracy in prediction can be expected when conditions most closely approximate those present in the institutions involved in this study. Namely, relocation was between a state-operated, long-term care institution with superior nursing care and nursing homes that were selected for their

ability to meet high quality standards of patient care. Increasing the differences between pre- and post relocation institutions or any compromise in the quality of care could be expected to change the discriminant coefficients of the prognostic indicators and increase the uncertainty involved in patient placement using the above formula.

Table 1

Demographic Characteristics of Experimental and Control Groups

	N=99 Experimental	Control
Sex		
Male	36%	38%
Female	64%	62%
Psychiatric Diagnosis		
Organic	69%	70%
Non-Organic	31%	30%
Chronicity		
($\bar{X}$,SD)	17.04 yrs. ± 20.31 yrs.	16.90 yrs. ± 18.92 yrs.
Age at Recommendation		
($\bar{X}$,SD)	78.07 yrs. ± 8.69 yrs.	76.07 yrs. ± 10.04 yrs.

TABLE 2

ANALYSIS OF VARIANCE
(N = 99)

	F-STATISTIC
Sex	1.098
Age at placement(years)	4.087 *
Length of time in the institution	0.961
Dementia	2.223 +
Cancer	0.103
Schizophrenia	0.061
Cardiovascular Disease	4.351 *
Cataracts	0.375
Healed Fractures	4.753 *
Osteoporosis	0.006
Scoliosis	0.091
Edentulousness	0.621

* Significant at 95% confidence level, Table F=3.84 for d.f.=1,97

+ Significant at 85% confidence level for d.f. = 1,97

TABLE 3

INTERCORRELATION COEFFICIENTS OF THE

REDUCED VARIABLE SET USED FOR THE DISCRIMINANT MODEL
(N=99)

	Age at Placement	Dementia	Cardiovascular Disease	Healed Fracture
Age at Placement	1.000			
Dementia	0.061	1.000		
Cardiovascular Disease	0.052	0.073	1.000	
Healed Fracture	-0.071	-0.039	-0.108	1.000

No correlations were statistically significant.

TABLE 4

DISCRIMINANT ANALYSIS RESULTS

	Discriminant Coefficients (N=99)	Discriminant Coef. Scaled (N=99)
Age at Placement	0.059	0.507
Dementia	0.744	0.355
Cardiovascular Disease	1.135	0.500
Healed Fracture	-1.223	-0.531
(Constant)	-5.081	

TABLE 5

VALIDATION OF DISCRIMINANT MODEL

	PREDICTED GROUPS	
ACTUAL GROUPS	DIED WITHIN 8.4 MONTHS	SURVIVED BEYOND 8.4 MONTHS
DIED WITHIN 8.4 MONTHS	59.4% (19)	40.6% (13)
SURVIVED BEYOND 8.4 MONTHS	41.8% (28)	58.2% (39)

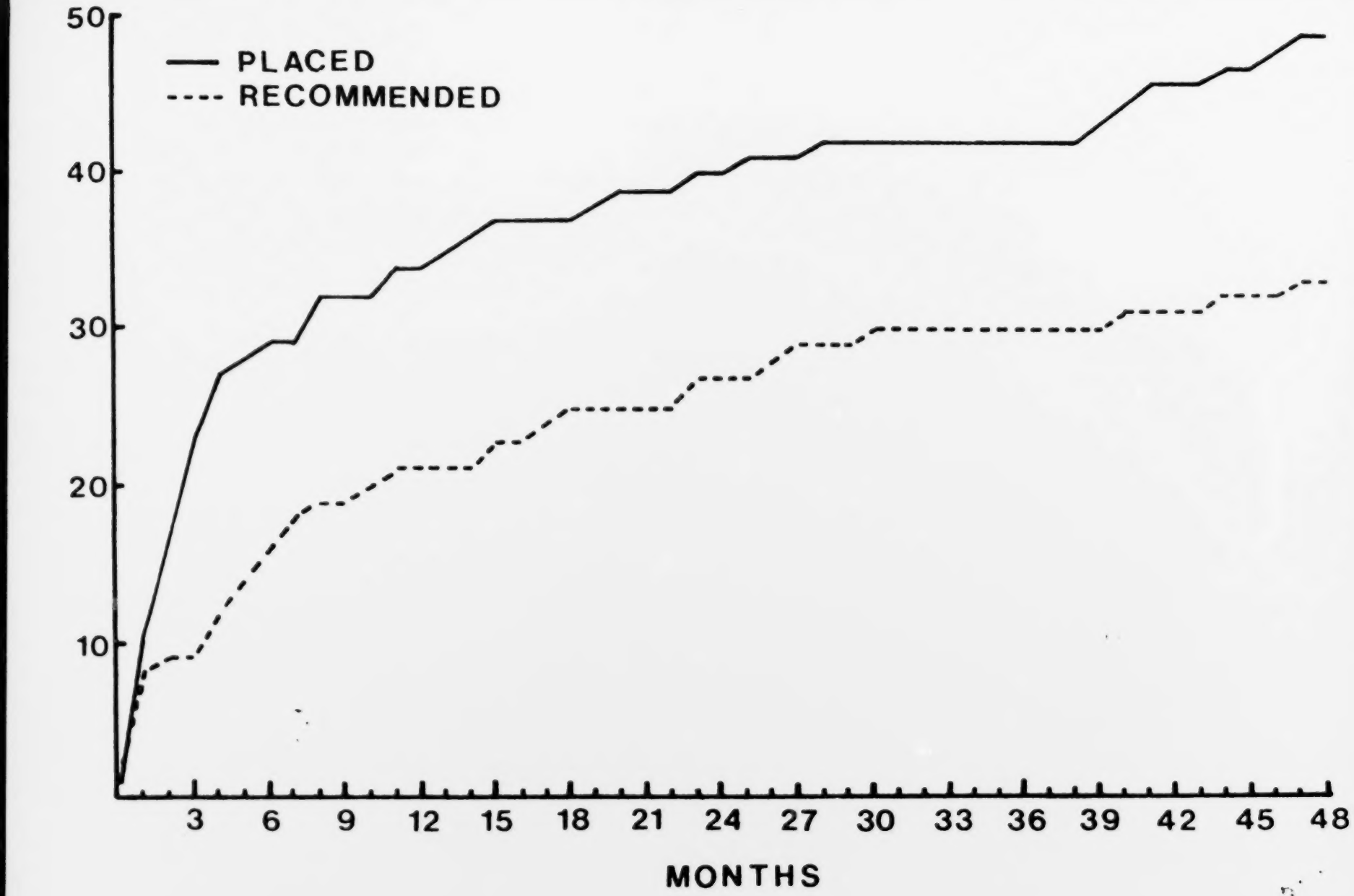
58.5%(58) Cases were correctly classified.

Figure Captions

Figure 1. Cumulative deaths by month in patients placed or recommended (but not placed) in nursing homes over a four year period.

Figure 2. The percent dying per month of those placed or recommended for placement in nursing homes and an institutional baseline for a four year period.

Figure 3. The mean number of deaths (± 1 S.E.M.) per quarter in institutional, recommended and placed patients over one year. The institutional death rate was derived by averaging the first, second, third and fourth quarters of each year during the four year placement period.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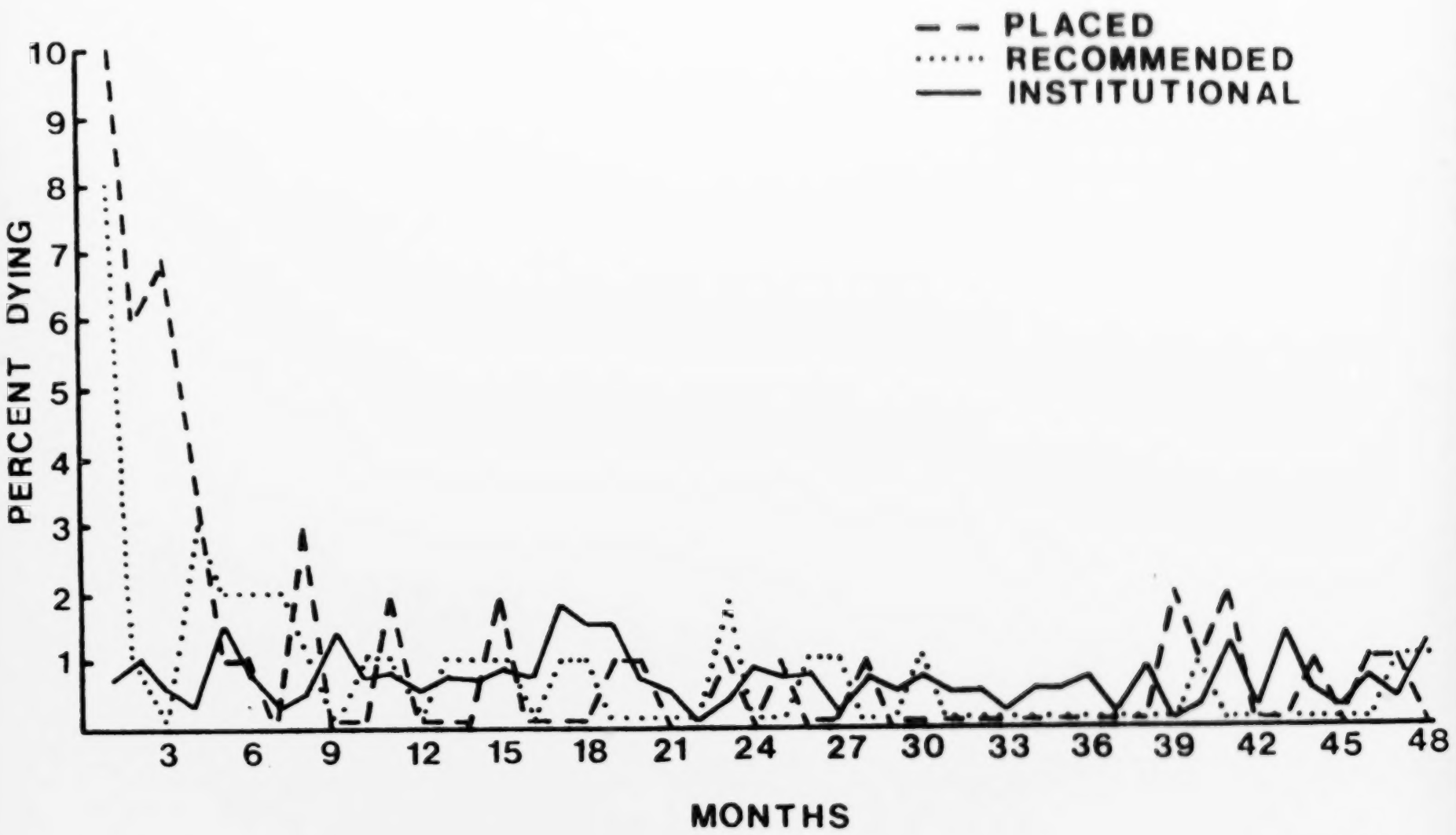
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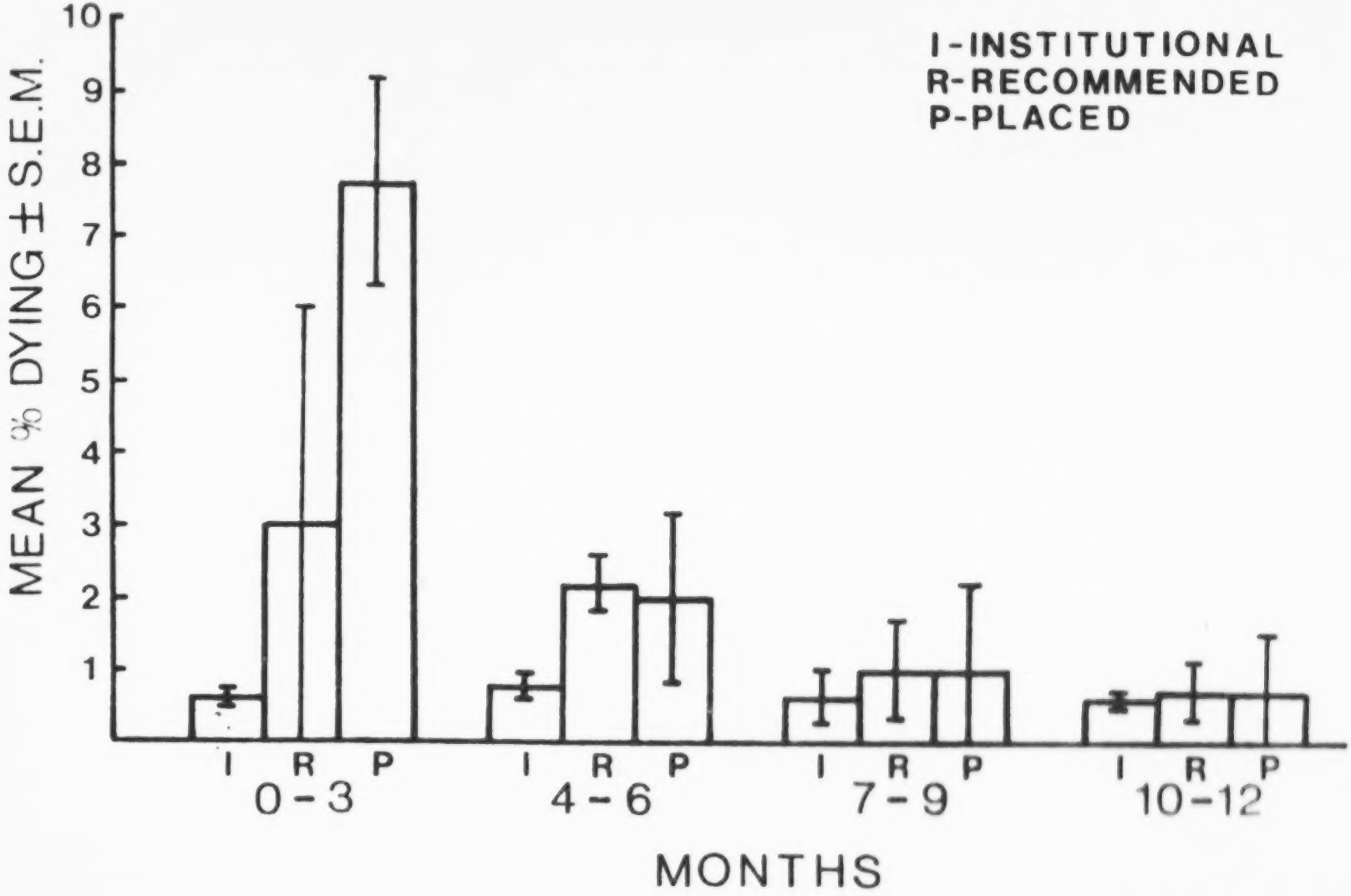
MONTHS


I-INSTITUTIONAL
R-RECOMMENDED
P-PLACED
MEAN % DYING ± S.E.M.
10
9
8
7
6
5
4
3
2
1
I R P
0-3
I R P
4-6
I R P
7-9
I R P
10-12
MONTHS